BULLETIN

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Shrubs and Trees of the Southern States.—I.

By John K. Small.

Tsuga Caroliniana Engelm. Coult. Bot. Gaz. **6**: 223. 1881.

I have already reported this rare hemlock from Georgia* and can now record a second station, at Tallulah Falls, several miles below the first one. At the second station the trees grow in a more accessible position and reach a better development, there being plenty of soil. The station is towards the lower end of the cañon, on the south side, where the bank slopes at an angle of 45° or more, and about 1000 feet above the river. Owing to a drenching rain which prevailed during my stay at Tallulah I could not ascertain the extent of this grove.

Pinus pungens Michx. f. Hist. Arb. Am. **1**: 61. *pl. 5.* 1810.

I can now report this most locally distributed of our mountain-inhabiting pines for the flora of Georgia, having encountered it in the lower part of the cañon at Tallulah Falls. For the same reason given in the foregoing paragraph, I am unable to tell the size of the grove, but it is extensive and the trees are larger than I have seen them elsewhere in the southern mountains.

Salix Wardii Bebb, Gard. & For. **8**: 363. 1895.

At the Falls of the Yadkin river in North Carolina both *Salix nigra* and *Salix Wardii* are plentiful, the black willow growing along the water's edge on the south side of the river, while *Salix*

* Bull. Torr. Club, **22**: 45.

Wardii occurs on the opposite shore hardly two hundred yards distant, the two species being respectively confined to the north and south sides of the river. The form of *Salix Wardii* occurring there is peculiar; the bushes are smaller than any heretofore observed, diffusely branched and the branches decumbent or almost prostrate, spreading radially and forming large, tangled mats, seldom rising more than six inches above the ground.

QUERCUS NANA (Marsh.) Sarg. Gard. & Forest, **8**: 93. 1895.

I was much surprised to find quantities of this scrub oak on the summit of King's and Crowder's Mountains near the southern boundary of North Carolina in the summer of 1894. The locality is within several miles of South Carolina and about one hundred miles east of the Blue Ridge.

QUERCUS RUBRA L. Sp. Pl. 996. 1753.

The existence of the red oak in Georgia was unknown to botanists before 1893. In that year I discovered a few trees just south of the North Carolina boundary, on the summit of the Thomas Bald, at an altitude of 5200 feet. The trees were stunted and irregular, as is characteristic at high altitudes. Last year, however, I found a remarkable development of the species in the northwestern corner of Georgia, in Catoosa county. The species abounds in the limestone "bottoms;" trees three feet or more in diameter are not uncommon, their trunks, naked often for seventy-five feet from the ground, are so straight that it is impossible to tell which way they will fall when cut off at the base. The thick bark is more or less mottled, whence the local name "Leopard Oak."

CELTIS MISSISSIPPIENSIS Bosc, Encycl. Agric. 7: 577. 1822.

Although extending over most of the western part of Georgia, this species of hackberry reaches its greatest development in the rich limestone "bottoms" in the region east of Lookout Mountain. Gigantic trunks, three or four feet in diameter, are very common, and are covered with innumerable corky warts, which range from one to two or even three inches in height.

DARBYA UMBELLULATA A. Gray, Am. Journ. Sci. (II.) 1: 388. 1846.

I have lately discovered a new station for this rare plant. It

grows in limited quantities on the south banks of the Yellow River, near McGuire's Mill, Gwinnett county, Georgia. I found it in company with its near relative, *Comandra umbellata.*

MAGNOLIA TRIPETALA L. Sp. Pl. Ed. 2, 756. 1763.

Another species new to the flora of Georgia, apparently never found so far southeast of the Blue Ridge. I first encountered some trees at the northern base of Stone Mountain, and later at several localities near the mountain. The trees are small and slender, and the species does not thrive as it does farther north.

CRATAEGUS ELLIPTICA Ait. Hort. Kew. 2: 168. 1787.

On several occasions, while collecting between Tallulah Falls and Toccoa Falls and in the Nacoochee Valley in northern Georgia I have observed numerous groves of *Crataegus elliptica* growing on the barren slopes of low hills, usually above streams, at altitudes varying from 1000–1500 feet. After several seasons' study of this form in the field I can see no reason for uniting it with *Crataegus flava* as a variety, as has lately been done.* Besides characters in the habit, the leaves, the fruit and seeds, which serve to separate it specifically from *Crataegus flava*, I find an apparent trustworthy distinction in the bark of the trunk. The bark of *Crataegus flava* is black and in high narrow ridges, while that of *Crataegus elliptica* is a light brown and in thin broad scales.

CRATAEGUS ROTUNDIFOLIA (Ehrh.) Borck. in Roem. Arch 1: Pt. 3, 87. 1798.

This species of *Crataegus* is very common in the southern Alleghanies and extends southward almost to the Gulf of Mexico. In 1895 I found it throughout the southern part of Georgia, where its favorite situation is the low ridges in the pine barrens, where the different species of hardwoods abound.

CLIFTONIA MONOPHYLLA (Lam.) Britton, Bull. Torr. Club, 16: 310. 1889.

This curious and local plant forms remarkably dense thickets in the swamps and districts bordering streams in the vicinity of the Altamaha river, especially north of Jesup, Georgia. The

* Silva of N. A. 4: 114.

stems there range from one-half of an inch to one foot in diameter, and the thickets they form remind one of those made by the growth of *Kalmia latifolia* and *Rhododendron maximum* on the higher mountains of North Carolina.

ACER LEUCODERME Small, Bull. Torr. Club, 22: 367. 1895.

When first described, this species was thought to be confined to the middle country of the Southern States, but my extensive journeys in Georgia last season brought to light two new stations in the foothills of the Blue Ridge and the Alleghanies; one is the deep cañon just below the precipice of Toccoa Falls, the other a shallow cañon along the Little Chickamauga creek near Ringgold. Both stations are similar to the original, and at both the tree holds all its characters.

ACER FLORIDANUM (Chapm.) Pax, Engler's Bot. Jahrb. 7: 243. 1886.

This characteristic maple is apparently very common in the river swamps of the Flint River in southwestern Georgia. Last summer I encountered a remarkable growth just below Albany. It probably follows the river to its mouth, for I again met it in the vicinity of Bainbridge. The trees are conspicuous on account of their close white bark and very dark foliage. Although said to be a small tree I measured many trunks that were three feet in diameter.

VACCINIUM HIRSUTUM Buckl. Am. Journ. Sci. 45: 175. 1844.

In April, 1893, I discovered this local and little-known huckleberry on the southern cliffs of the cañon at Tallulah Falls, Georgia. This apparently is the first collection since the original discovery by Buckley in Cherokee County, North Carolina. In 1894 Prof. A. Ruth found the shrub on the Cade's Cove Mountains in eastern Tennessee, thus adding the third station and the third State in which the species is known to exist.

Contribution to the Myxogasters of Maine.—II.

By F. L. Harvey.

The excessive rainfall in Maine during the season of 1896 made the conditions most favorable for the growth of all kinds of fungi. We have never before seen such magnificent specimens of fleshy fungi, nor such fine myxogasters. The favorable season, together with more careful research, made by Mr. E. D. Merrill, a member of the Junior Class at the Maine State College, and myself, has brought to light nearly thirty species not before reported from the State. Quite a number of these are rare in the United States and a few new to this country. They are recorded below. Appended is a list of new localities by numbers, which refer to a former list (Bulletin, Aug., 1896) and to the numbers of this. Our specimens have been carefully determined with the compound microscope and the results confirmed by Mr. A. P. Morgan, who has kindly examined all the species offering any difficulties. Notes upon some of the species reported in a former list will be found in their proper places in the text. Some there mentioned will have to be combined as synonyms, while some included doubtfully have been confirmed. Mr. Merrill's specimens were collected on the shores of Lake Auburn, where, in a week, he obtained over forty species.

Ord. Physaraceae.

87. *Cytidium globuliferum* Bull. Orono, Aug., 1896. On fallen trunks. (Harvey.) E. Auburn, Nov., 1896. (E. D. Merrill.) On fallen hemlock. The sporanges of Mr. Merrill's specimens were rather small for the species, but otherwise characteristic.

88. *Cytidium rufipes* A. & S. Orono, Oct., 1896. (Harvey.) Nov., 1896, E. Auburn. (Merrill.) Specimens scanty on fallen, decaying leaves. The above includes *P. aurantium rufipes* A. &. S.

89. *Craterium minutum* Leers. = *C. pedunculatum* Trentepohl. On decaying leaves. Orono, Sept., 1896. (Merrill.) Oct., 1896. (Harvey.) E. Auburn. Nov., 1896. (Merrill.)

90. *Physarum cupripes* B. & R. Orono, Sept., 1896. (Harvey.) Mr. Morgan says of our specimens. "Fine! Capillitium with much lime."

91. *P. connexum* Link. Greenfield, Sept., 1896. (Harvey.) Abundant on dead wood and bark. Included by Lister in *P. compressum* Alb. & Schw. Our specimens answer to *P. affine* Rost. nearly.

92. *P. imitans* Racib. Orono, Oct., 1896. (Harvey.) On moss associated with *Arcyria* and *Diderma*, scanty. A small species with sporanges .5 mm. diameter and liable to be overlooked. Mr. Morgan says of a specimen sent him "its large sharp pointed nodules are apparent even under a ¾-in. objective."

93. *P. ornatum* Peck. Greenfield, Sept., 1896. (Harvey.) On dead wood. Morgan says "this is a fine species and yours is an elegant specimen."

94. *Physarum diderma* Rost. Orono, Oct., 1896. (Harvey.) Mr. Morgan made the following note on a specimen sent him: "This is exactly like my specimens, which I refer to *P. diderma* Rost. I have found it only twice and distributed it to Rex, McBride and Sturgis who agree with me. I do not regard it as *P. diderma* Lister." This is a rare species heretofore only collected by Mr. Morgan and only twice by him. To find it in Maine is interesting.

95. *P. striatum* Fr. Western Sisters' Is., Penobscot Bay, Aug., 1896. (Harvey.) We sent Mr. Morgan a specimen and he says "It is referable to the above species. I have the yellow form also, which is *P. aurantium* Pers. From what little material I have, I am inclined to think the two may stand for a good species." Both have disappeared from Rostafinski's monograph and from Lister's work.

96. *Fuligo candida* Pers. Head of Pamedomcook Lake, Oct., 1895. (Harvey.) Two specimens taken, which were referred to Mr. Morgan who makes the following note: "I never saw anything like it. It is not *Fuligo cinera* Schw. The spores are oval to oblong, minutely warted, 10–11 x 9–10 mic. and the lime nodules are different. The specimens are good ripe ones showing the internal structure nicely. We will call it *F. candida* Pers. The cortex is whitish, fragile, and soon breaking into small patches. This form is included under *Fuligo septica* Link (Gruel) by Saccardo, but is very different. Persoon's species should be restored.

96a. *Fuligo muscorum* A. & S. Eastport. Prof. W. G. Farlow. Omitted from our former list.

97. *Badhamia verna* Rost. Orono. Me. Oct., 1896. (Harvey.) This is an exceeding rare species. It = *Physarum vernum* Sommerfeldt sent by him to Fries in litt. (See Fries S. M. 3: 146.) Rostafinski cites but one other specimen, found at Freiberg by De Bary. To find it in this country is remarkable. Lister merges it with *B. panicea* Rost., but wherever placed the species is new to this country. The sessile sporanges are hard to detect on the mossy logs where it grows. We have never found it but once, and then in very small quantity. Mr. Morgan, to whom a specimen was sent, thinks "it is just as near as can be to the specimen described by Fries."

98. *Badhamia capsulifera* Bull. Orono, Oct., 1896. (O. W. Knight.) Lister puts this under *B. hyalina* Berk. He says that the spores are like those of *B. hyalina* Berk. The plasmodium from which our specimens come was very large and at one end the sporanges were finely obovate and at the other end globose and some of the sporanges were lobed. Some were long stalked and others sessile. The large plasmodium would suggest *B. utricularis* Berk. if that is a distinction between *B. hyalina* Berk. and *B. utricularis* Berk. Our specimens were regarded as the above species by Mr. Morgan, who includes in his description (M. M. V., p. 106) *B. hyalina* Rost. We incline to Massee's view *a polymorphous species* for the above and *B. utricularis* Bull.

99. *Scyphium rubiginosum* Chev. Orono, Oct., 1896. (Merrill.) Nov., 1895. (Harvey.) Mr. Merrill's specimens were found on moss, sticks and on the base of alders near a brook. My specimens were found on the base of a fir tree in deep woods. Not abundant.

Ord. Didymiaceae.

100. *Lepidoderma tigrinum* Schr. Orono, Oct., 1896. (Harvey.) Only a few scattered sporanges found amongst moss on the underside of a declining trunk, two feet from the ground. *A rare species.* Mr. Morgan says it is scanty in Ohio.

101. *Diderma radiatum* Morgan = *Chondrioderma radiatum* Rost. Orono, Oct., 1896. (Harvey.) Scanty specimens were found amongst lichens on hemlock bark. Mr. Merrill found this species much more abundant at E. Auburn, showing finely the radiate structure

of the ruptured sporanges and the columella. The outer peridium breaks up in patches and the sporanges were hard to detect, resembling the scaly growth of a young *Parmelia*. This is a rare species in this country but promises to be abundant in Maine.

102. *D. spumarioides* Fr. E. Auburn, Nov., 1896. (Merrill.) A single plasmodium found on decaying leaves. A species with small subglobose sessile contiguous sporanges, whitened by a coating of lime. Rare in Maine.

103. *Spumaria alba* Bull. Head of Pamedomcook Lake, October, 1895. (Harvey.) Growing on moss. Two specimens taken, Orono, October, 1896, and E. Auburn, Nov., 1896. (Merrill.) On sticks and grass. Specimens taken by Mr. Merrill at Orono were infested by the rare fungus *Hypomyces candicans* Plow., which has never before been recorded from this country, and by nobody abroad except Plowright. He found it on a Myxogaster, but did not know the species. Our specimens have well developed asci. The form described by Mr. Ellis as *Nectria Rexiana* (Ell.), and found by Dr. Rex on *Chondrioderma spumarioides*, is the young of the same thing. We sent Mr. Ellis a specimen and he said it was the same as his *Nectria Rexiana* Ell.

104. *Didymium lobatum* Nees, Greenfield, Oct., 1896. (Harvey). This form is included by Rostafinski under *D. farinaceum* Schrad. It may be distinct.

Ord. Stemonitaceae.

Remarks: Comatriche crypta Schw. Greenfield, Aug., 1896. (Harvey.) Nov., 1896. E. Auburn. (Merrill.) Mr. Morgan said of our Greenville specimens that they were well grown and typical. The form which Dr. Rex described as *C. irregularis*, and which Lister makes a variety of Peck's *C. longa* is only a ragged, poorly developed state of *C. crypta*. We find this and the type in the same plasmodium. Abundant in Maine, forming plasmodia several inches across. This is no. 38 of a former list.

Comatriche nigra Pers. Greenfield, Aug., 1896. (Harvey). A few scattered sporanges on decaying wood. Reported in a previous list (no. 57) as *C. obtusata* Preuss. Lister includes the above, together with another form which we find at Orono that was described as *C. Suksdorfii* by Ellis in his *C. obtusata* Preuss. The latter may prove a distinct species.

105. *Lamprodrma scintillans* B. & Br. E. Auburn, Nov., 1896 (Merrill.) A small cluster of sporanges on decaying wood.

106. *Clastoderma DeBaryanum*, Blytt. Orono, Oct., 1896. (Harvey.) A few scattered sporanges on rotten wood. A small species easily overlooked.

ORD. RETICULARIACEAE.

107. *Reticularia splendens* Morgan. Oldtown, Greenfield, Orono. (Harvey.) E. Auburn. (Merrill.) This was reported as *Enteridium Rozeanum*. (No. 53 of former list.) We have sent specimens to Mr. Morgan, who pronounces them his *R. splendens*. He insists that his species is distinct from European specimens called *E. Rozeanum*.

108. *R. umbrina* Fr. = *R. Lycoperdon* Bull. Oldtown, Greenfield, Orono. (Harvey.) E. Auburn. (Merrill.)

Mr. Morgan thinks *R. atra* Fr. (No. 43 of former list) = *R. umbrina* Fr.

ORD. LICEACEAE.

Remarks: Licea minima Fr., Orono, Oct., 1896. (Harvey.) This species was reported in a previous list (No. 50) from crushed specimens in the Blake Herb. collected by Blake. The rediscovery establishes this form as a Maine species. It is rare. Mr. Morgan wrote us he had never seen the species before, but that it agreed exactly with Fries' description. The spores are 11–13 μ. *Licea fragiformis* (Bull.) Nees. Orono. Oct., 1896. (Harvey.) This may prove to be distinct from *Tubulina cylindrica* Bull., with which it is merged by Lister.

109. *Lycogala flavofuscum* Ehr. Brunswick, 1896. (Kate Furbish.) A single specimen among some fungi sent for determination. Habitat not known.

ORD. TRICHIACEAE.

110. *Trichia fragilis* Sow. E. Auburn., Nov., 1896. (Merrill.) This was growing with *Hemiarcyria rubiformis* Pers., which it resembles somewhat in color.

Remarks: Morgan puts *T. Jackii* and *T. affinis* DeB. (Nos. 58 and 65) of our former list together. He says of our specimens: "They are genuine *T. Jackii* Rost., if you want to take spore sculpture for species."

Regarding specimens of *Hemiarcyria* sent Mr. Morgan he says "your specimen is genuine *H. clavata* Pers. and the only one I ever saw." This species seems to be common in Maine.

ORD. ARCYRIACEAE.

111. *Heterotrichia Gabriellae* Massee. E. Auburn, Nov., 1896 (Merrill). Growing on wood. The only specimens before reported are from South Carolina. Morgan says of our specimens that they are all right both for genus and species and that it is a remarkable species. We are unable to see how Lister can unite this to *Arcyria ferruginea*, which is a common species in Maine and very unlike the above in habit and structure.

112. *Arcyria pomiformis* Rost. = *A. ochroleuca* Fr. = *A. lutea* Schw. Orono, 1890. (Harvey.) Mr. Morgan says "this is a good species, wholly distinct from *A. cinerea* Pers., with which Lister merges it. I always get it in like your sample with only a few sporangia to the specimen. I have had it only from S. Carolina before. It is a minute species and is certainly extremely rare in America." It is not common in Maine.

Remarks: Of a specimen of *Arcyria* we sent Mr. Morgan he says "it is exactly *A. aurantiaca* Raunkier. I have his work with this species elaborately illustrated and it agrees exactly. The calyculus of your specimen is minutely warted, not reticulate. The sculpture of the thread is finer than in *A. ferruginea*."

113. *Lachnobolus incarnatus* A. & S. Orono and Greenfield. (Harvey.) Our specimens agree with what Prof. McBride described as the above species. Lister merges it with *L. circinans* Fr. Our form is probably a distinct American species, deserving a new name.

ORD. PERICHAENIACEAE.

114. *Perichaena microcarpa* Schroeter. Orono, Oct., 1890. (Harvey.) Only a single specimen found which was sent to Mr. Morgan, who says it puzzles him exceedingly, but he thinks it nearest to the above. He makes the following notes: "Spores 14–17 mic., strongly spinose, but the color is yellow-brown; threads not yellow, but hyaline. I cannot discover lime anywhere; the wall is yellow, or when more thickened, yellow-brown. Evidently rare and new to the country."

115. *P. marginata* Schw., Orono, etc. (Harvey.) E. Auburn, Nov., 1896. (Merrill.) The specimens a little weathered, but the internal characters all right. Not abundant. We have seen this at several localities, but thought it the young of some other Myxogaster until this season.

NEW LOCALITIES FOR MAINE MYXOGASTERS.

The numbers refer to a previous list (BULLETIN, Aug., 1896), and to the numbers of this article.

Eastport: Prof. W. G. Farlow, Bull. Bussey Ins. 1876, p. 430. Nos. 40, 47, 96a.

Brunswick: Kate Furbish, No. 109.

Western Sisters' Island, Penobscot Bay, near Mt. Desert, Long Island: F. L. Harvey, Nos. 19, 26, 34, 35, 76, 81, 95.

Head of Pamedomcook Lake: F. L. Harvey, 96, 103.

Orono: O. W. Knight, No. 98; E. D. Merrill, Nos. 48, 89, 99, 102, 103; F. L. Harvey, Nos. 50, 87, 88, 89, 90, 92, 94, 97, 99, 100, 101, 106, 107, 108, 112, 113, 114.

Greenfield: F. L. Harvey, Nos. 37, 38, 91, 93, 108, 113.

E. Auburn: E. D. Merrill, Nos. 1, 10, 13, 14, 17, 18, 19, 26, 32, 34, 38, 42, 47, 52, 54, 55, 57, 58, 59, 61, 62, 65, 68, 69, 73, 75, 81, 82, 86, 87, 88, 89, 99, 101, 102, 103, 105, 107, 108, 110, 111, 115.

Contribution to the Gasteromycetes of Maine.

BY F. L. HARVEY.

This list embraces all the gasteromycetes known by the writer to have been collected in Maine.

It includes all the species referred to in the literature at hand, besides the species found in the collections of the Portland Society of Natural History and the Blake Herbarium of the Maine State College. The species detected by the writer and his pupils are also included. No special efforts have been made to do exhaustive collecting, and the list may be regarded as preliminary. Correspondence with parties interested in Maine Cryptogams is solicited, and additional references to Maine species of the above order will be gratefully received and credited.

We are under obligations to Mr. A. P. Morgan and Prof. Trelease for the examination of specimens.

We have followed Saccordo in most cases in the arrangement of the genera.

GASTEROMYCETES.

I. Ord. Phalloideae.

1. *Phallus daemonum* Rumphius = *Dictyophora daemonum* Lev. Growing at base of a pine stump in a pasture. Not abundant. Orono, Sept., 1894. Three specimens taken. (Harvey.) Odor offensive.

2. *Phallus impudicus* Linn. = *Ithyphallus impudicus* (L.) Fr. Growing in a meadow near the woods. Two fine characteristic specimens taken. Sept., 1896. (Harvey.) Offensive.

3. *Mutinus brevis* B & C. = *M. Ravenelii* (Berk. & Curt.). Found in abundance for several seasons on the ground about the roots of a clump of lilac bushes; also seen in several other places. The most common *phalloid* in Maine. Found about sink holes sometimes. Offensive. Orono, Me. (Harvey.)

Fam. II. Nidulariaceae.

4. *Nidularia pulvinata* (Schwein.) Fr. Rotten logs. Orono. (Harvey.)

5. *Cyathus striatus* (Huds.) Hoffm. Sacc. Syll. 7:33. On the ground and upon railroad ties. Orono, Me. (Harvey.)

6. *C. vernicosus* (Bull.) DC. Sacc. Syll. 7 : 38. Orono, Me. (Bartle, Harvey.)

7. *C. stercoreus* Schw. Ground. Orono. (Harvey.)

8. *Crucibulum vulgare* Tul. Sacc. Syll. 7 : 43. P. S. N. H. Coll. No. 28. (Fuller), Portland (Bolles), Blake Herb. Cumberland (Blake), Orono (Harvey). Common on decaying twigs, logs and boards.

9. *Sphaerobolus stellatus* Tod. Sacc. Syll. 7 : 46. Abundant upon decaying wood and on the ground. Orono. (Harvey.) The peridium of this species opens with a stellate border. The inner wall protrudes until it is obovate in form and finally bursts with force, throwing the sporangium several inches. We put some of these plants into a cigar box once, and in a few hours many sporangia were found fastened to the sides of the box.

10. *S. tubulosus* Fr. Rather common about Orono on decaying boards. Orono, Sept., 1896. (Harvey.)

II. Ord. Lycoperdaceæ.

11. *Geaster hygrometricus* Pers. Port. Soc. Nat. Hist. No. 36. Old Orchard (Fuller), Blake Herb. Maine State College; Wells (Blake), Cape Elizabeth (Fernald), Belfast (Upton), Western Maine (Miss Furbush). On the ground.

12. *Calvatia cyathiforme* Bosc. Several specimens found in pasture near Orono last of Aug., 1896. Some specimens about 6 inches in diameter. A large handsome species. (Harvey.)

13. *Bovista plumbea* Pers. Sacc. 7:96. Common in pastures, Orono. (Harvey.)

14. *B. circumscissa* Berk. et Curtis. Sacc. 7: 104. Cumberland. (Blake.)

15. *B. pila* Berk. et Curtis. Sacc. 7: 104. Common in pastures. Orono & Jackman. (Harvey.)

16. *Lycoperdon gemmatum* Batsch. Sacc. 7: 106. Harrison (Blake), Orono, Greenville, Norcross (Harvey), Brunswick (Furbish). Most common species. On decaying logs and stumps, also on the ground. Quite variable as to form and coating of spines. Aug.–Sept.

17. *L. gemmatum molle* Pers. Sacc. 7: 107 = *L. molle* Peck = *L. muscorum* Morgan.

18. *L. bovista* L. Sacc. 7: 109. There is a specimen of this species in the Bost. Soc. Nat. Hist. collections as *Lycoperdon giganteum* Batsch. We have not detected this species in Maine.

19. *L. furfuraceum* Schaeff. Sacc. 7: 110 = *L. pusillum* Batsch. Cumberland (Blake), Orono (Harvey). Pastures and roadsides.

20. *L. Wrightii* B. & C. Sacc. 7:111. On the ground in pastures, etc. Orono and vicinity. (Harvey.) Variable as to spines.

21. *L. pyriforme* Schaeff. Cumberland (Blake), Orono, Jackman, Norcross (Harvey), E. Auburn (Merrill), Brunswick (Kate Furbish).

22. *Lycoperdon asterospermum* D. & M. Orono. (Harvey.)

23. *L. glabellum* Peck. Orono, 1896. (Harvey.) On ground in woods. Not abundant.

24. *L. Turneri* E. & E. Ground pastures and open woods. Orono, Greenfield, Sept. and Oct. (Harvey.)

25. L. *subincarnatum* Peck. Growing in clusters on decaying wood, Greenville. Orono and Norcross. (Harvey.) August.

26. *L. Curtisii* Beck. In pastures. Orono. (Harvey.)

27. *L. separans* Peck. Ground in pastures, Orono, Me. Very abundant in October. (Harvey.)

28. *L. pedicullatum* Peck. Ground and on rotton wood. Orono, Me. (Harvey.)

29. *Scleroderma vulgare* Hornem. Western Me. (Blake.) Orono, under fir trees and at Pea Cove on decaying logs. (Harvey), Belfast (Uptom) E. Auburn (E. D. Merrill).

Further Considerations of the Biological Status of Lichens.

By Albert Schneider.

In a previous number of the Bulletin I have given a brief statement of the biological status of lichens. The paper was essentially a restatement of Reinke's views on the subject. The present object is to continue the discussion and to present different phases and other details. Limited space will not permit entering into lengthy discussions, nor is this called for, since the details here touched upon have already been fully discussed elsewhere. The intended function of this paper is primarily educational, pointing out the best method by which the conscientious student may arrive at a rational conclusion relative to the nature of lichens. This seems necessary since many botanists (in verbal communication) are most persistent in designating and classifying lichens as fungi (in agreement with Schwendener). And this is not all; some so-called lichenologists are just beginning to take notice of Schwendener's theory and wonder "whether there is anything in it," while others have not even heard of this theory or ignore it entirely.

The stubborn resistance offered to the recognition of lichens as a distinct class (in the sense of Reinke, not Tuckerman, Acharius and others), may be said to have a beneficial influence upon the general progress of lichenology. Controversy and difference

of opinion is to science what the governor is to the engine, it insures a more steady progress by urging more thorough study and greater care and consistency in formulating conclusions. It is, however, a fact which cannot be denied that (with a few exceptions) the most vehement objectors to Reinke's theory are those who have little scientific perspective and who have done little or no scientific work in lichenology. Among the more scientific class of botanists the principal cause of the difference of opinion lies in the difference of the point of view. The Schwendenerians are essentially morphologists (histologists) of the older school who consider structure and not function of prime importance. The followers of Reinke are the product of the modern school of biological investigation which teaches that the morpho-physiological method is the true one. That is, it should be the investigator's purpose to give a proper physiological interpretation to the morphological conformation. Peculiarly enough Schwendener is quite universally recognized as the founder of this school. It should also be borne in mind that at the present time Schwendener raises no serious objection to Reinke's views.

Until recent years the pure systematists held full sway. Morphological studies were resorted to simply as an aid to classification; hence those structures which proved most useful in forming or perfecting a system received first attention. In the various systems of fungi the characters of the spore-bearing tissue was found most useful. On comparing the apothecia of lichens with the reproductive organs of fungi, certain morphological similarities were noted and at once the conclusion was reached that lichens must be fungi. No efforts were made to demonstrate whether or not the spores of lichens were functionally the same as those of the fungi. The study of the thallus was neglected because it was not clear what practical use could be made of it in classifying lichens as fungi. Schwendener himself, as well as many investigators before and after him, made careful morphological investigations of the various lichen-thalli. Schwendener indeed demonstrated that the gonidia in the majority of lichens were true algae, but he did not give a true explanation of the relationship existing between the fungus and the enclosed algae (gonidia). Reasoning from the standpoint of morphology he concluded that

lichens were the result of the parasitism of fungi with algae, a conclusion without any physiological basis, as later investigators have demonstrated.

Eminent investigators, after years of careful study attempting to give a corresponding physiological interpretation to the morphological specializations as they occur in the lichen-thallus, have concluded that it cannot be compared to any fungal structure.

The recent progress in the study of the phenomena of mutualistic symbiosis has a very important bearing upon the recognition of the true nature of lichens. There are botanists who are scientifically so unprogressive as to recognize no other form of symbiosis * than "parasitism" (antagonistic symbiosis). Such will, of course, persist in maintaining the "parasitic" nature of lichens. There are all gradations between mutual antagonistic symbiosis (mutual parasitism) and complete individualism.† Upon a recognition of these phenomena depends the proper consideration and treatment of lichens. Furthermore, the phenomena of symbiosis have an important bearing upon the modern conception of the cell, some problems in evolution, and upon the interdependence of plants and animals. It is intended to define and discuss these phenomena in some future paper.

Symbiosis has also a direct bearing upon the consideration of what constitutes a morphological unit. When a form of symbiosis has reached the stage of complete individualism there can be no doubt that the resulting structure constitutes a morphological unit in the true sense of the word. The important question at this phase of the subject is whether or not the form of symbiosis as it occurs in lichens is sufficiently specialized that the resulting structure may be recognized as being autonomous. In attempting to solve this problem it is necessary to consider the following: 1. Is the lichen-structure morphologically and physiologically distinct from the symbionts? 2. Have the symbionts wholly or partially lost the power of independent existence?

* The term is here used in its broader meaning. It includes all forms of contiguous associations of two or more morphologically distinct organisms accompanied by a loss or acquisition of assimilated food-substances.

† Complete individualism is a form of mutualistic symbiosis in which *none* of the symbionts can exist independently (examples: some of the higher lichens, the cell). Semi-individualism is a form of mutualistic symbiosis in which at least *one* of the symbiants cannot exist independently (the Collemas and other lichens).

The first question has already been answered in the affirmative by Reinke, Bonnier, Bornet and others. The second will receive some further consideration. As far as lichens are concerned investigators are quite generally agreed that the fungal symbiont can no longer lead an independent existence. It is absolutely dependent upon its symbiotic association with the algae. It is also generally believed that the algae (gonidia) can exist independently. At least, many of the lichen-algae have been cultivated in artificial media. Some recent experiments in this line would lead me to conclude that the algae of some of the higher lichens can not exist independently for any considerable period of time. It became apparent at once that related single-celled algae occurring free in nature develop more readily than the lichen-algae when placed in or on artificicial media. Repeated attempts to cultivate the algae (*Cystococcus humicola* Näg.) of *Cladonia* have only partially succeeded. The algae would soon acquire an impoverished appearance; changing from bright green to yellowish green and finally to a pale straw color. Cell-division occurred only rarely and at long intervals during the beginning of the experiment. Soon cell-division and growth ceased altogether. In some of the experiments a species of natural algae (*Protococcus viridis* and another species) accidentally introduced developed rapidly, soon forming a green layer over the substratum (schistose rock, sandstone, limestone). These natural algae frequently occur upon the surface of the lichen-thallus and are apt to gain access to the culture media. They can, however, readily be gotten rid of by the isolation method. Culture attempts with algae (*Cystococcus humicola* Näg.) from several species of *Parmelia* gave similar results. In no case was it possible to develop a colony of any considerable size nor could the growth of the culture be maintaned for any considerable period of time. From these experiments the conclusion seems justifiable that the algae of some of the higher lichens are no longer capable of leading a continued independent existence. Fungus and alga, during their association as lichen, have become mutually adapted so that they are complimentary in their relationship as a morphological whole. It is safe to conclude that at least some of the lichens form absolute individualism. Even the most prejudiced, therefore, cannot hesitate in recognizing such lichens as morpho-

logical units. In regard to the lower lichens and some of the higher (Nostoc-bearing) there seems to be evident semi-individualism, though further carefully conducted experiments are necessary to settle this point.

Without entering into details I shall briefly summarize the essential differences between lichens and the ascomycetous fungi. This summary is deduced from the results obtained by the most scientific lichenologists during the past forty or fifty years. These statements are especially intended for those who are continually forgetting that there is a difference between fungi and lichens.

1. The morphological adaptions of the vegetative portion of lichens is primarily for the furtherance of the function of *chlorophyll-assimilation*; in fungi it is for the furtherance of the function of *reproduction* (distribution of spores, etc.).

2. Fungi are essentially parasitic and saprophytic. Lichens have partially or wholly lost the saprophytic or parasitic function and have phylogenetically acquired the power of converting inorganic substances into organic compounds by a process of photosynthesis. Morphologically and physiologically lichens resemble other chlorophyll-bearing plants; fungi do not.

3. In lichens the mechanical tissues * are specially adapted to support and protect the assimilation tissue; in fungi the mechanical tissue is specially adapted to support and protect the sporogenous tissue.

4. The soredia of lichens are special phylogenetically-derived propagative organs and have no homologues among the fungi. The cyphellae and cephalodia are also phylogenetically derived lichen-structures.

5. The spores of fungi can develop into mature fungi; the spores of lichens cannot develop into mature lichens. In other words fungi may develop from spores, lichens cannot.

6. Lichens are better adapted to resist extremes of temperature and dryness. Fungi are better adapted to dark moist places.

7. In general lichens are long-lived while fungi are short-lived. Some of the higher as well as the lower lichens (*Cladonia, Par-*

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* More fully described by Zukal and in my Text-book of General Lichenology now in press. In this book the citations of the more important literature on lichenology will be given.

melia, *Sticta*, *Lecidea*, *Biatora*) have an indeterminate existence. The life-period does not terminate with the maturation of the spores, as with the majority of fungi.

8. The spore-bearing tissue of lichens is of little functional value, hence it degenerates or becomes converted into a chlorophyll-bearing assimilating tissue (sterile *Parmelias* and *Cladonias;* podetia of *Cladonia*, thalloid exciple). Among the fungi the sporogenous tissue becomes functionally more and more specialized.

9. Lichens contain chemical compounds (lichenin, acids, etc.) which do not occur among fungi.

10. Morphological similarities (in the vegetative tissues of lichens and fungi they rarely occur) do not indicate similarity in function. (See 1.)

Finally I will again urge the necessity of conducting modern biological research from the standpoint of morpho-physiology. It will be productive of reliable and harmonious conclusions.

The Affinities of Dendrobangia Rusby.*

By H. H. Rusby.

(Plate 294.)

The family Olacineae, as treated by Bentham and Hooker (Gen. Plant, 1: 342 and 995) comprises four tribes. Olaceae has the ovary normally 3–5-celled, occasionally 1-celled by suppression, with two pendulous ovules in each cell. Opilieae has the ovary 1-celled, with one erect ovule. Icacineae has the ovary normally 1-celled with two, rarely one by abortion, unilaterally dendulous ovules. Phytocraneae has characters very similar to those last mentioned.

Dr. Engler (Pflanzenfamilien, 3: Abt. 5, 233) separates the two tribes last mentioned, under the family Icacinaceae, grouping them with the Aceraceae, Celastraceae and Anacardiaceae, referring the Euphorbiaceae, also to this group. The two tribes first mentioned he retains in the family Olacinaceae and groups them with the Aristolochiaceae, Loranthaceae and Urticaceae.

* Mem. Torr. Bot. Club, 6: 19.

The affinities of *Dendrobangia* are clearly with the Icacinaceae. Of this Dr. Engler makes three sub-families, to one of which, the Icacinoideae, with 1-celled ovary, *Dendrobangia* pertains. Of the four tribes of this sub-family, three comprise only climbing plants and their floral characters exclude the genus under consideration, which is clearly a member of the tribe Icacineae. In this tribe Dr. Engler recognizes 26 genera, all but 7 of them having the calyx gamosepalous, thus excluding *Dendrobangia*, the sepals of which are barely coherent at the base. Of these 7 genera, *Villaresia* is the only one known to have representatives in America. *Villaresia* has the petals imbricate, while in *Dendrobangia* they are perfectly valvate. From the six foreign genera the plant is distinguished as follows: *Cassinopsis*, of Africa, has the stamens opposite the petals. *Leptaulus*, of Africa, has a slender infundibular corolla. *Alsodeiopsis*, of Africa, has the filaments free from the corolla-tube. *Platea*, of Polynesia, is polygamous, and has the stamens free. *Sarcanthidion*, of New Caledonia, has the petals imbricate, like *Villaresia*. It may be said that, in addition to the characters given, none of the above have apical appendages to the petals, while this is a most important character of *Dendrobangia*. Although the remaining genus, *Chariessa*, of New South Wales, has such appendages, they are very different from those of *Dendrobangia*. The petals of *Chariessa*, moreover, are distinct, except at the very base, and its stamens are free. The characters of filament and anther and the absence of a style would also certainly exclude *Dendrobangia* from that genus. It appears, therefore, that the plant is strikingly distinct from any other genus, and that it combines in a remarkable manner the characters of the associated genera. It agrees with *Villaresia* in the general ovary-characters, with *Alsodeiopsis* and *Leptaulus* in the partially gamopetalous corolla, with *Leptaulus* in the adnate filaments, with *Platea* in the sessile stigma, and with *Chariessa* in having apical petal-appendages.

In the description of the plant already published, a number of points were misinterpreted or overlooked, and that description should be amended as follows: The sepals are barely coherent at the base, which fact, taken in connection with its general characters, must place it in the first section, described as having a chorisepalous calyx. The term "corolla-lobes" and not "petals,"

should be used, as the corolla is gamopetalous nearly to the middle. The corolla-appendages are lacerate-toothed rather than "bearded." The mature stamens are more than "half the length of the corolla exclusive of its appendages." The appendages of the petals appear to elongate considerably during the opening of the bud, and they are widely explanate when the flower is expanded, becoming early detached. They appear to act as pollen-holders. Their mode of origin is peculiar. They are not continuous with the tips of the petals, but originate from the inner face of the latter.

Explanation of Plate 294.

Fig. 1. Flowering branch, slightly reduced.
Fig. 2. A bud.
Fig. 3. Longitudinal section of bud, showing concave lateral face of theca.
Fig. 4. Anther, showing attachment of connective.
Fig. 5. A petal with its appendage.

Some new Fungi, chiefly from Alabama.

By Lucien Marcus Underwood.

In certain favorable seasons the Southern States offer fine opportunities for field work in mycology. It is fortunate that we are beginning to have intelligent field workers that are resident instead of transient collectors, for it is only by persistent resident work that anything like a clear understanding of the flora can be obtained. While much is still to be desired in many of the Southern States, it can safely be said that the States of Alabama and Mississippi, at least, are now fairly well equipped with local workers, as compared with neighboring States, if one or two workers for an area of 50,000 square miles can be regarded as a fair equipment. Many species are comparatively ephemeral, and only the local observer who is at hand at the favorable moment is able to gather the harvest. The fall season of 1895 was specially unfavorable for field work, on account of excessive drought, and this condition prevailed more or less throughout the spring season. In fact, not until July, 1896, were the rains sufficient to bring out the normal hymenomycetous flora. Since that time, and particularly during the months of October, November and December,

1896, Professor Earle reports a very prolific growth of fleshy species, and among them he sent a very interesting series of the central and lateral stemmed forms of the genera *Polyporus*. These, together with a few others collected by myself in the same region, and one or two from elsewhere, are described below. For convenience the genera and species are arranged alphabetically.

HYDNUM CHRYSOCOMUM n. sp.

Resupinate, forming areas 2–6 cm. each way; mycelial strands wide-creeping, more or less branched, bright orange-yellow, expanding here and there to form a membranous subiculum bearing the bright orange-yellow spines; subiculum thin, whitish fimbriate at the margin, yellowish within and later bright orange-yellow; spines crowded, 1 mm. or more long, often confluent so as to appear flattened, terete when single, concolorous, rather obtuse.

Growing under much decayed sticks, New Dorp, Staten Island, New York, October 17, 1896. Smaller and imperfect specimens had been previously found in Indiana and Alabama, with well-developed mycelium and scanty spines. A well-marked species and easily recognized by its brilliant mycelial strands and the color of its spines.

LEPIOTA MAMMAEFORMIS n. sp.

Pileus thin, white, with a dull brownish strongly umbonate disc, 5-8 cm. in diameter, mealy squamulose, the margin strongly sulcate-striate, somewhat incurved; gills rather narrow, moderately close; stem 12-18 cm. long, flexuous, hollow, tapering upward from an elongate thickened base, over 1 cm. at its greatest thickness, the narrow distant annulus often finally deciduous.

Growing caespitosely from near the base of a decaying *Broussinetia* on the streets of Auburn, Alabama, July 1896. The gills turn darker in drying and the umbo becomes strikingly prominent.

LEPTOGLOSSUM ALABAMENSE n. sp.

Black throughout, gregarious, 2–3 cm. high. Ascoma about 1 cm. long, flattened, in the dry condition about 2 mm. wide and 0.5 mm. thick, blunt or rounded, horny, yellowish within; stem roughened, somewhat enlarged at base; spores hyaline, straight or slightly more or less curved, biseriate in the asci, becoming 4-septate, 18–20 x 4 μ; paraphyses abundant, thickened and darker colored at the tip.

On the ground, Auburn, Alabama. July.

PERONOSPORA PLANTAGINIS n. sp.

Mycelium parasitic in well-defined yellow areas of the leaf, occupying the entire width and a length of 1–3 cm.; conidiophores usually solitary, long exserted, irregularly 5–6 times dichotomous; ultimate ramulae short, unequal, recurved, 4–12 μ long; conidia narrowly oval or lemon-shaped, pointed at each end, dark, almost black by reflected light, brownish violet by transmitted light, 40–44 x 16–18 μ. Oöspore unknown.

On leaves of *Plantago aristata*, Auburn, Alabama, May, 1896. F. S. Earle.

PERONOSPORA SEYMOURII Burrill n. sp.

Sparse, forming white patches or lines on leaves and stems; oöspores on floral organs. Mycelium large, distorted, haustoria knob-like; conidiophores slender, seven or eight times dichotomous, branches flexuous, spreading, tips short or of moderate length, subulate; conidia subglobose to elliptical, variable, 12–18 μ by 14–27 μ, brownish; oögonia with firm, rather thick brownish walls, reaching 70 μ in diameter; oöspores dark brown, opaque, thick-walled, rough, 27–45 μ.

On *Houstonia* sp. Union and Jackson counties, Illinois, April 11–28, 1882. (A. B. Seymour.)

The above description was furnished me by Professor T. J. Burrill. Having found what appeared to be an undescribed species of *Peronospora* on *Houstonia patens*, in Auburn, Alabama, I learned by accident that a species had been found on the same host many years ago and that its description written at the time by Mr. Seymour had laid in manuscript until now. The Alabama specimens appear to be the same species, but no oöspores were found. In the Alabama specimens the conidiophores were about 400 μ long, with a diameter of about 6 μ; the branching was alternate, the main branches being 70–90 μ long and the ultimate branches or sterigmata 6–10 μ; the conidia were more often ovate, 21 by 11–14 μ.

POLYPORUS DECURRENS n. sp.

Mesopous; terrestrial; pileus nearly circular, 5 cm. in diameter, plane or slightly depressed at the centre, brown or bay-colored, covered with a thin crust which is glabrous except where it is raised at certain points to simulate, when dried, an imbricated surface; pores nearly white, forming a layer about 2 mm. deep, decurrent on the stem and vanishing in faint reticulations just above

the base, slightly angular, 0.5 mm. in diameter; dissepiments thin, entire; context white, probably fleshy when fresh, compact, homogeneous, about 7 mm. thick at the centre, gradually becoming thinner; margins thin, slightly involute when dry; stem somewhat bulbous at base, 3 cm. or more long, tapering above, 1 cm. in diameter at the apex, 1.5 cm. below, somewhat darker than the pores.

Growing in soil on the side of a cañon near the Soldier's Home, near Los Angeles, California. Feburary, 1896. Dr. H. E. Hasse. (Communicated by A. J. McClatchie.)

A very characteristic species; the pileus in drying presents a very irregular surface, certain points which have the appearance of slight imbrications remaining more elevated, while the intermediate spaces become deeply depressed; it is hoped that more material can be secured of this interesting plant and that its characters may be noted in the field. The measurements were made from the dry specimen and are naturally somewhat less than in the fresh condition.

Polyporus Earlei n. sp.

Mesopous; terrestrial; stem 4–5 cm. long, 1–1.5 cm. or more thick, colored like the pileus; pileus 7–12 cm. each way, cinereous, slightly darker towards the centre; margin very thin, much incurved in drying; context soft-fleshy, grayish, drying to a thin layer; pores 1–2 mm. deep, somewhat whitish-stuffed when young, cinereous gray, paler when young and, towards the margin, small (less than 0.5 mm.), the dissepiments rather firm, entire.

Pine woods, Auburn, Alabama, Nov., 1896. Prof. F. S. Earle.

The plant is cinereous throughout and retains this color when dry. It gives me great pleasure to associate with this plant, the name of my former genial co-laborer and companion in many "fungus forays," who is contributing largely to our knowledge of mycology in a much neglected section of the Union.

Polyporus flavo-squamosus n. sp.

Pleuropous; terrestrial; stem 7–8 cm. long, 4–5 cm. thick, slightly flattened, irregularly roughened, colored like the pileus; pileus 15 cm. each way, yellowish, with a slight tinge of greenish; covered with rather small floccose imbricate scales, which form a very thin fragile crust, channeled behind where the edges nearly meet; margin rather acute, more or less incurved in drying; context white or slightly yellowish, fleshy, firm, becoming almost woody when dry; pores 5 mm. deep, rather large (about 1 mm.),

irregular, angular, with thin dissepiments, slightly decurrent, white, changing to greenish where wounded, yellowish when dry; spores oval or ovoid, 9 x 6 μ, with a single large highly refractive gutta.

Growing in clayey soil, Auburn, Alabama, 23 Nov., 1896. Mrs. F. S. Earle.

POLYPORUS IRREGULARIS n. sp.

Pileus irregular, more or less branching, brownish, paler towards the margin, uneven, subtomentose, with a thin imperfect crust, the under layer of which is darker colored, forming a delicate brown line in section; 4–6 cm. long, 3–4 cm. wide, the margin usually thin; context white, floccose-felty pores white, 5 mm. or more deep, irregular, more or less angular, small (0.25 mm.), the dissepiments rather thin, firm, even.

Growing irregularly underneath a pine log, Auburn, Alabama, Feb., 1896.

The older portions are ferruginous brown above, and the free margins, when developed, are thin and distinctly paler brown for a space of about 1 cm. The extreme margin is sterile, and the pores which are normally even, become irregular and oblique as the margin tends to become erect.

POLYPORUS MELIAE n. sp.

Pileus convex, dirty white, subtomentose, anoderm, 5–8 cm. in diameter, occasionally coalescing; margin obtuse, sometimes extending nearly or quite around the pores; cortex floccose-corky, whitish; pores cream white, becoming darker with age, more or less rimose, 5–6 mm. deep, minute (about 0.2 mm.), the dissepiments firm, slightly uneven, usually with obtuse edges; spores narrowly oblong, 6x3, hyaline.

On branches of *Melia Azederach*, Auburn, Alabama, Oct., 1895.

In very old specimens the layer of pores becomes cracked in all directions and very much discolored.

POLYPORUS RETIPES n. sp.

Terrestrial; stem excentric, 4–6 cm. long, 2 cm or more thick, yellowish-white towards the base; pileus 6–15 cm. each way, brown, appressed tomentose, finely areolate-rimose so as to appear finely mottled; context fleshy, rather thick (2 cm. or more) becoming quite thin in drying, whitish; margin acute; pores decurrent half the length of the stem, shallow, whitish, large (1.5 mm. or more), mostly hexagonal, the dissepiments thin and finely lacerate.

The young pores are very shallow and the stem appears reticulate-veined nearly to the base. As the pores become older they deepen and those nearest the base of the stem become more or less obscured.

In pine woods, Auburn, Alabama, Dec., 1896. Mrs. F. S. Earle.

PUCCINIA POLYSORA n. sp.

II., III. Amphigenous; sori very small, short, very numerous but irregularly scattered, remaining long enclosed in the tough epidermis of the host, at length rupturing by a narrow slit; uredospores large, broadly oval, 35 × 30 μ, scarcely echinulate, the epispore of medium thickness, pale rusty brown; teleutospores variable, usually short, irregularly oblong, often somewhat constricted at the septum, averaging 25 × 40 μ, the cells often irregularly angled, the upper usually broader than long, blunt or rounded above; apex not thickened; pedicel usually short.

On *Tripsacum dactyloides*, Auburn, Alabama, August and October, 1891, B. M. Duggar.

USTILAGO SPARSA n. sp.

Parasite infesting occasional ovaries and transforming them into somewhat sphaerical olivaceous pustules covered by the changed and roughened seed coat, 1–3 mm. in diameter, the remainder of the inflorescence unchanged; spores regularly oval, distinctly echinulate, about 7–9 μ in length.

Related to *U. neglecta* Niessl. and *U. spermophora* B. & C., but distinguished from them by its larger pustules and smaller spores. It has nothing in common with *U. Dactyloctaenii* P. Henn. Die Pflanzenwelt Ost-Afrika, 5 : 48 which occurs on the same host, has dark violet horn-shaped sori and smooth spores, 10–14 μ.

In scattered ovaries of *Dactyloctenium Aegyptium*, Auburn, Alabama, November, 1895, and October, 1896. Underwood & Earle.

February 8, 1897.

An undescribed Lechea from Maine.

BY EUGENE P. BICKNELL.

One of the most characteristic plants of York Harbor, Maine, is a species of *Lechea* which abounds in dry open places, especially

over the weedy downs near the sea. Upon visiting York Harbor some years ago my attention was at once arrested by this plant, which was obviously neither *Lechea intermedia* nor *Lechea maritima*, the only eastern pinweeds which could be considered at all in connection with it. Subsequent investigation discovered that the plant, though it had never been discussed in print, had not been overlooked by botanists, but had been a long-standing puzzle variously solved, it appeared, in terms of one or the other of the species named above. Material from different collectors which had formed part of Mr. Leggett's collection and bore his penciled memoranda showed that the plant had perplexed that careful student of the genus, who had at different times referred it doubtfully both to *Lechea intermedia* and to *Lechea maritima* and had at least entertained the idea that it might be referable to the more western *Lechea stricta*. It may be said here that Mr. Leggett's material was not fairly representative of the plant and was quite insufficient to form a basis for any safe conclusions. For this reason the same material was passed over by Dr. Britton in his revision of the genus (Bull. Torr. Club, 21: 244–253, 1894), which therefore affords no help in the present case. In Dr. Robinson's recent critical treatment of the genus (Syn. Fl. 1: Part 1, 192–194, 1895) we find the first published notice of the Maine plant. It is there mentioned under *Lechea stricta* as being nearly related to that species, but as probably to be referred to *Lechea intermedia*. The case, therefore, stands to-day just as it was left by Mr. Leggett over fifteen years ago.

During several visits to York Harbor in August this pinweed has claimed my particular attention, and I have realized in the field that the problem it presented was indeed a perplexing one. The main facts in the case seem to be these: The plant has much the aspect of *Lechea stricta*, and is hence frankly distinguished in appearance from *Lechea intermedia;* nevertheless, though closely allied to the former it is not that species, but is a more or less immediate derivative of the latter, as is shown by the occurrence of forms not satisfactorily referable to either plant.

Technically, therefore, on the evidence, the plant is a variety of *intermedia*—an incompletely detached derivative of that species. Actually it has reached a degree of differentiation which, measured

by the slight differences separating species in this group of plants, is certainly remarkable, and may fairly be taken as of species value despite the apparently intergrading forms. Indeed, so distinct from *intermedia* does the typical plant appear that it may well be questioned whether intergradation between the two is not, after all, more apparent than real. When we recall instances of perfectly distinct species exhibiting an apparent identity up to the time of full maturity of flower or fruit we find ourselves less ready to assign doubtful specimens to the category of intergrades. It may be readily conceived that between certain individuals of nearly related plants an inherent distinctness may be completely disguised to the eye as a result of retarded development or other cause. Be this as it may, I am sufficiently satisfied of the expediency of recognizing as a species the *Lechea* here discussed. To refer it to either of its near allies would be to evade a difficulty through a makeshift, and as for varietal rank the grade *variety* has been misused out of all definite meaning. Species are necessarily of different values. Closely similar but trenchantly distinct plants range side by side with species far more divergent from each other, yet inter-related through medial forms. The relegation of such well-characterized plants to the vague rank of *variety* surely involves a disregard of the facts of nature not to be excused by an appeal to the supposed requirements of a system of nomenclature necessarily more or less artificial.

For the new plant I propose the name *Lechea juniperina* in allusion to the appearance of its densly leafy narrow panicle, which is often suggestive of a spiry red cedar (*Juniperus Virginiana*) in miniature.

LECHEA JUNIPERINA n. sp.

Tufted from a descending and branched woody root, 2–5 dm. high. Stems erect, often from an outcurved or ascending base, mostly purplish and naked below the middle at flowering-time, branched above the middle to form a dense narrow panicle; branches short, numerous, closely ascending, mostly 2–5 cm. long (1–9 cm.); pubescence consisting of fine white hairs, at first densely appressed, becoming loosely substrigose-hoary or even subtomentose-canescent; leaves numerous, crowded, ascending or appressed, thickish, slightly revolute in drying, only the midvein evident, glabrous above, below with the midrib finely strigose-

pubescent, and with some loose marginal hairs, the petioles 1–2.5 mm. long, appressed white-pubescent on the under side; stem-leaves linear to oblong-linear and oblanceolate, mostly tapering towards the base and more abruptly narrowed at the apex, acute or subacute, 1–2.2 cm. long, 2–4 mm. wide, those of the branches much smaller, narrowly linear, acute; inflorescence forming a dense and leafy narrow panicle, 10–20 cm. long (in reduced plants much smaller and more or less terminal), the numerous short-pedicelled flowers crowded in short axillary racemes and clustered at the ends of the branches; fruiting calyx ovoid-ellipsoid, 1.5–2 mm. long; pedicels 1–3 mm. long, often very short in the clustered terminal flowers; inner sepals elliptic, subacute, nerveless or faintly 3-nerved, reddish-purple, at least on the margins, the shorter outer sepals usually bright green in marked contrast; capsule ovoid-subglobose, 1.5–2 mm. long; petals reddish-purple, oblong-linear, with only a mid-vein, about 2 mm. long by 1 mm. wide; leaves of basal shoots narrowly elliptic, acute at each end, somewhat pilose-hairy on the midrib and margins or nearly glabrate. The plant blooms in August. The basal shoots do not begin to develop until September.

In reduced states the plant is only 1–3 dm. high and linear in general outline, the more persistent leaves appressed, the shortened panicle more or less terminal and sometimes only 1 cm. wide.

A form which grows in the shade of copses or park-like woods is more slender and less leafy than the typical plant of neighboring open ground, the leaves looser and often spreading, the more open panicle much less floriferous and more racemose-paniculate.

Specimens have been examined from various localities along and near the Maine coast from York Harbor to Mt. Desert.

Lechea intermedia Leggett differs from *L. juniperina* in less tufted habit and often larger size, becoming 7 dm. tall. The pubescence is somewhat coarser and more strigose, and composed of shorter, less whitened hairs, never becoming tomentose or canescent. The stem is usually greener, with the more persistent leaves less crowded and appressed and with more verticillate tendency. The leaves are often larger and longer, becoming 2.8 cm. long and 5 mm. wide, and are rarely if ever distinctly oblanceolate. The panicle is more or less loose and open with fewer and larger, more globose, longer-pedicelled flowers, which are mostly loosely racemose and never glomerate-clustered. The broader usually orbicular sepals are green or only with the slightest purplish tinge and strongly nerved, the nerves often five in number and branched;

the petals are larger and broader and mostly 3-nerved, the stigmas twice as large, the outer sepals commonly shorter and closer. The leaves of the basal shoots are often larger and relatively narrower and usually more hairy.

Lechea stricta Leggett, as compared with *L. juniperina*, is a paler, more silky-canescent plant, especially when young, the narrower acute leaves more pubescent, even pubescent over the lower surface and sparsely hairy above, the branches longer and massed above to form a broader panicle, the rather smaller and more globose longer-pedicelled flowers not at all glomerate, but distinctly racemose-paniculate and showing little or no purple.

L. juniperina appears to occupy a somewhat intermediate position between *L. intermedia* and *L. maritima* Leggett, although it need never be confused with the latter. *L. maritima* is, in fact, very distinct from all our species and is strongly characterized by its rigidly bushy-branched habit, dense tomentose-canescence and the oblong densely-pubescent leaves of the basal shoots.

Notes on two western Plants.

By P. A. Rydberg.

Lonicera glaucescens.

Lonicera parviflora var.? Torr. & Gr. Fl. N. Am. 2: 7 (partly). 1840.

Lonicera Douglasii Hook. Fl. Bor. Am. 1: 282. 1833. Not *Caprifolium Douglasii* Lindl. Trans. Hort. Soc. London, 7: 244. 1830.

Lonicera hirsuta glaucescens Rydb. Cont. U. S. Nat. Herb. 3: 503. 1896.

After seeing more material I have become perfectly convinced that this is just as good a species as any in the genus. The same conclusion has been reached independently by Dr. J. K. Small, who intended to describe it as new, not noticing my description cited above. He has also informed me of some of the localities given below. To the characters given in my description in the Cont. U. S. Nat. Herb. l. c., I can add a feature which then escaped my observation and which distinguishes *L. glaucescens*

from all forms of *L. hirsuta*. The leaves of the former always have a chartaceous margin which is also common in *L. dioica*, but never occurs in *L. hirsuta*.

The following localities are to be added to those given in the Contributions. These localities are based upon specimens in the herbaria of the Ohio State University, Oberlin College, Lafayette College and Columbia University:

Pennsylvania: S. W. Knipe, 1868; 1871; Guttenberg, 1879; C. E. Smith, 1864; McMinn.

Ohio: F. B. Mason; Andrew Auten, 1896; Mr. Krebs, 1891; W. A. Kellerman, 1895.

Michigan: Dr. Pitcher, 1829; F. E. Boyce, 1883.

Isle Royale: T. C. Porter, 1865.

Ontario: Dr. and Mrs. Britton and Miss M. Timmerman, 1889; T. J. W. Burgess, 1881.

Saskatchewan: E. Bourgeau (Palliser Exp.), 1858.

South Dakota (Black Hills): W. S. Rusby, 1887.

Geum (Sieversia) turbinatum.

Potentilla nivalis Torr. Am. Lyc. N. Y. 1: 32. 1827. Not Lapeyr, 1782.

Geum Rossii Torr. & Gr. Fl. N. Am. 1: 424. In part. 1840. Not *Sieversia Rossii* R. Br.

This has gone under the name of *Geum Rossii* (R. Br.) DC. without any question ever since Torrey and Gray's Flora was published in 1840. *Sieversia Rossii* was described from specimens collected on the Melville Island by Lieutenant Ross during Captain Parry's first voyage. *Geum Rossii* is a distinctly arctic species, ranging from the Baffin Bay Islands to Alaska. *Geum turbinatum* is found in the higher Rockies of Colorado, New Mexico, Arizona, Utah, Nevada and Southern Wyoming. It is not found in the mountains of British North America, and I have no record of its having been collected in Montana or Idaho. The two species are therefore separated by a distance of almost 2,000 miles. The arctic plant has much larger flowers, from 2 to 2½ cm. wide, while in the Rocky Mountain plant the flower scarcely exceeds 1½ cm. In the latter the bractlets are narrowly lanceolate and much shorter than the tube of the calyx, which is decidedly turbinate, espec-

ially in fruit. In the true *G. Rossii* the bractlets are usually broadly ovate and about the length of the tube. It has, as a rule, a more hairy calyx and upper part of the pedicels. In *G. tubinatum* the leaves, as a rule, are much deeper cleft and with narrower segments. The pedicels are also much more slender and longer. The upper stem-leaves and bracts are much reduced, entire, or with linear segments, while in *G. Rossii* the segments, as well as the stipules, are broad and large.

G. humilis (R. Br.) Steud., (*Sieversia humilis* R. Br.), is not found in the United States. The *G. Rossii humile* of Torrey and Gray's Flora and Watson's Report of the Botany of King's Expedition has nothing to do with *Sieversia humilis* R. Br. from Unalaska. It is simply a more hairy *G. turbinatum*, not worthy of varietal rank. Of the true *G. humile*, I have seen only one specimen, collected by John Chapman, in 1893, also on Unalaska. It resembles *G. Rossii*, but is more coarsely hairy and the leaflets are broader and incised rather than divided. Whether it should be regarded as a variety of *G. Rossii* or a distinct species I cannot decide from the insufficient material seen.

Two undescribed eastern Species.

By N. L. Britton.

Viola Atlantica.

Glabrous, or with a few scattered hairs, acaulescent; rootstock thick, erect. Flowering scapes very slender, 4′–8′ high, mostly longer than the leaves; petioles much longer than the blades; blades broadly ovate to reniform in outline, 1′–3′ wide when mature, deeply subpedately parted into linear or oblanceolate, acute or acutish lobes, the lobes with a few low distant teeth, or entire, the middle one somewhat the broadest; sepals linear-lanceolate, long-acuminate, 4″–5″ long; petals blue, longer than the sepals, at least the lateral ones bearded; capsule oval-oblong, nearly 6″ long, glabrous.

Eastern Massachusetts to southern New Jersey, in sandy soil along the coast. Simulates *V. delphinifolia*. May–June.

Geranium Bicknellii.

Similar to *G. Carolinianum* but taller, the stems usually more slender, loosely pubescent. Leaves slender-petioled, somewhat

angulate in outline, the segments oblong or linear-oblong, mostly narrower; peduncles slender, 2-flowered, the inflorescence loose; sepals lanceolate, awn-pointed; ovary-lobes pubescent; persistent filaments longer than the carpels; beak about 1′ long, long-pointed, its tip 2″–3″ long; seeds reticulated.

Nova Scotia (?) Maine to Western Ontario and southern New York.

A new Ribes from Idaho.

RIBES LEUCODERME.

A shrub, four to six feet high, freely branching above, the branches inclined to droop; main stem rather stout, covered with thin light gray epidermis, which peels off in shreds; branches, especially the younger ones, pubescent with very short and thick white tomentum, the growing ends furnished with long-stalked yellow glands; infrastipular spines solitary, or sometimes in pairs on young branches, nearly an inch long when mature, slender and very sharp, from a stout base, slightly curved downward, yellow-brown; leaves broadly ovate, or almost orbicular in outline, the largest two inches in diameter, deeply three-lobed, the lateral lobes sometimes cut, so as to give the leaf the appearance of being five-lobed, the lobes all coarsely crenate-serrate, pubescent on both sides with short white hairs, and usually resinous-dotted, ciliate; petioles slender, pubescent, usually as long as the blade; flowering rachis an inch in length, or less, furnished with stalked glands, two-flowered; flowers approximate, on short, glabrous pedicels; bracts very small, shorter than the pedicels, almost orbicular, fringed with stalked glands; calyx tubular, nearly a half-inch in length, glabrous on the outside, hairy within in the throat, greenish white, or sometimes tinged with purple, the lobes narrowly oblong; petals narrow, obovate, little more than half the length of the calyx-lobes, white; anthers on glabrous filaments; style pubescent; fruit spherical, four lines in diameter, unarmed, purplish when fully ripe.

Collected at Lake Waha, in the Craig mountains, Nez Perces county, Idaho, by Mrs. Heller and the writer, June 2, 1896. Type, number 3175, in flower. It was also collected in fruit at Forest, Nez Perces county, by Mr. H. E. Brown, in August, no. 17. It is common on the Craig mountains, growing on the edge of the forest, and in moist copses, at elevations of 2,000 to 3,500 feet. It is the plant called *Ribes oxyacanthoides*, by Holzinger, in Contr.

U. S. Nat. Herb. 3: 225. It is apparently common in northern Idaho and adjacent Washington and, although found in various collections, has always been referred to the very different *R. oxyacanthoides*, which seems to be confined to the eastern part of the continent.

A. A. HELLER.

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Reviews.

*Flora of the Amboy Clays.** After many vexatious delays the Flora of the Amboy Clays has appeared. It makes a handsome quarto volume, uniform with other U. S. Geological Survey Monographs, of 260 pages and 58 plates. Its distinguished author was one of the fathers of American paleobotany and it is much to be regretted that he could not have lived to see the publication of his valuable material. But it was not to be, and it is fortunate, indeed, that so able an editor was found to carry on the book to its completion. It will stand as a monument to the painstaking discrimination and acumen of the one and the careful judgment of the other.

The so-called Amboy Clays take their name from Perth Amboy and South Amboy, in New Jersey, and embrace some 350 feet of clays, usually of much commercial importance, that are there best exposed. As a formation, however, the Amboy Clays extend from northeastern Maryland diagonally across the State of New Jersey, the southern portion of Staten Island and the north shore of Long Island to the southern counties of Massachusetts. These clays have furnished the rich flora, which is the subject of the present monograph.

Biologically speaking the Amboy Clay flora is of much interest. It consists of 156 species, of which just 100 are described as new to science, besides a number of more or less doubtful fragments. The most striking feature of the flora is the great

* *Flora of the Amboy Clays.* By John Strong Newberry. A posthumous work, edited by Arthur Hollick. Monographs U. S. Geol. Surv. Vol. 26: Wash., Government Printing Office, 1895 (1896). pp. 260. *pl. 58.*

preponderance of phanerogams, there being only 10 species not belonging to this class. This approaches somewhat closely to the proportions existing in the present between the higher cryptogams and the dominant types, and suggests at once the comparative modernness of the Amboy flora.

Of the 10 cryptogams enumerated, one is regarded as an alga, one as an hepatic, and the remainder are ferns, one of the most interesting being an undoubted *Ophioglossum*. The Cycadaceae are represented by 3 genera and 5 species, and the Coniferae by 15 genera and 19 species. No monocotyledons were obtained. The angiospermous dicotyledons are represented as follows: Juglandaceae, 1 genus and species; Myricaceae, 1 genus and 7 species; Salicaceae, 2 genera and 5 species; Fagaceae, 1 genus and species; Ulmaceae, 1 genus and species; Moraceae, 1 genus and 3 species; Proteaceae, 2 genera and 3 species; Magnoliaceae 3 genera, 11 species, of which the remarkable *Liriodendropsis* is described as new; Menispermaceae, 1 genus, 2 species; Lauraceae, 4 genera, 8 species; Rosaceae, 1 genus and species; Leguminosae, 7 genera and 10 species; Aquifoliaceae, 1 genus and species; Celastraceae, 2 genera, 11 species; Aceraceae, 1 genus and species; Rhamnaceae, 2 genera and 2 species; Vitaceae, 1 genus, 2 species; Tiliaceae and Passifloraceae each with 1 genus and species; Myrtaceae, 1 genus, 5 species; Araliaceae, 3 genera, 12 species; Cornaceae, 1 genus and species; Ericaceae, 1 genus, 4 species; Myrsinaceae, 1 genus, 3 species; Sapotaceae, Ebenaceae, Asclepiadaceae and Caprifoliaceae each with a single genus and species; uncertain affinities, 8 genera and 19 species.

This brief enumeration brings out clearly the great diversity of the flora, for there are not less than 30 well marked modern families represented, and often with a goodly number of species. It seems unreasonable to suppose that this complex dicotyledonous flora should be anywhere near the actual beginning of this great class of plants, as has recently been suggested. It must have had a long period of development before such diversity could have been attained.

From the geological side this work furnishes a valuable and timely contribution to the controversy regarding the presence of Jurassic strata along the Atlantic border. The Amboy Clays are

shown to be higher than the Potomac of Virginia, and to have strong affinities with the Dakota group, the Atam and Patoot beds of Greenland, the Cretaceous clays of Aachen, Germany, and the upper Cretaceous rocks of Bohemia. The geological position and the abundant angiospermous flora furnish a complete refutation of the contention that the Amboy Clays can belong to the Jurassic.

The task of editing a posthumous work is always a delicate one, since the editor is in constant fear of not correctly interpreting the author. In this respect Mr. Hollick seems to have been very judicious, and has made only such changes in the original manuscript as were necessary on account of discoveries made or publications issued subsequent to the time when the author ceased active work. These changes are presented in the form of footnotes over the editor's initials; the work, therefore, is essentially Dr. Newberry's.

The plates, in point of mechanical finish, are unquestionably the best that have thus far been made of this class of objects by the Geological Survey. The printing is also of good quality, but it is unfortunate that the book should be marred by an incorrect date of issue. It appears from the letter of transmittal that it was submitted in March, 1894. It bears on the title page the date of 1895, whereas it was only issued in the last days of 1896.

F. H. K.

Spermatozoids in Phanerogams. The leading articles in recent numbers* of the *Botanisches Centralblatt* are contributed by two Japanese botanists, Prof. S. Ikeno, of the University at Tokio, and Dr. S. Hirase, of the same institution. In these two rather brief papers is announced a discovery of great interest to the botanical world—that of spermatozoids in *Ginko biloba* and *Cycas revoluta.* If confirmed, this will prove one of the most significant additions to the comparative morphology of the higher plants that has been made since the time of Hofmeister.

While more details are promised in papers that are to follow, enough is given in these preliminary contributions to inspire a good degree of confidence. In *Ginko biloba*, according to Dr. Hirase, a

Botanisches Centralblatt, 69: 1–3; 33–35. 1897.

pollen-tube is formed, which penetrates the ovule, but does not come in contact with the archegonium. The nucleus of the pollen-tube divides, parallel to the long axis of the tube, into two daughter nuclei, one of which continues to grow and divides again into two in a similar way. The latter two daughter-cells become the ciliated motile male gametes. These spermatozoids are described as exhibiting a nucleus completely surrounded by cytoplasm. They are of an ovoid form, 82 μ long by 49 μ broad; the head consists of three spiral turns, these bearing numerous cilia, and a pointed tail is also present. As soon as the spermatozoids escape from the pollen-tube into a fluid which by this time has accumulated in the nucleus, they swim quite actively about with whirling movements.

The writer does not state that he has traced out the course of events from this time on. Prof. Ikeno has found in *Cycas revoluta* spermatozoids similar in structure and development to those of *Ginko*, but has not seen them in motion, as his observations were confined to material collected at a distance and treated with various fixing reagents. MARSHALL A. HOWE.

Contributions towards a Monograph of the Laboulbeniaceae. By Roland Thaxter. Memoirs Am. Acad. **12**: 187–429. *pl. 1–26.* D. 1896.

This is one of the most elaborate works that has yet appeared on American mycology and has set a pace that it will be difficult for many to follow. The author has been peculiarly fortunate in having before him an almost open field, since, of the 158 species known, 130 are American and with one or two exceptions have been described by the author himself; he has, moreover, described several of the exotic species. It is a privilege that few can enjoy to enter a field so free from the necessity, to borrow an expression from a colleague, "of first clearing the Augean stable of synonymy." The limits of species and genera have thus been a new problem and the group is fortunate in thus having its outlines marked by a skilled investigator. Besides the careful diagnoses of genera and species, there are twenty-six plates that are as nearly perfect as the art both of the author and of the engraver can make them; these illustrate all the species described. The author also gives some general discussion of the group and brings out more fully than in his former papers the two most important

features of the group: (1) that they are true ascomycetes, and (2) that they possess a sexual method of reproduction. The group is an obscure one, its members living parasitic on insects and having a simple structure and microscopic size, but inconspicuous as the group is, it is likely to throw much light on the origin and relations of some of the higher fungi, and is certain, at least, to throw doubt on the Brefeldian conclusions regarding the origin of the ascomycetes. American botany is indebted to the author for his laborious work on this unknown group of fungi and for his elaborate monograph. L. M. U.

Ferns and Fern Allies of New England. By Raynal Dodge. Pp. 52. Binghamton, N. Y., Willard N. Clute & Co. 1896.

This little handbook, which can be slipped into the pocket, will be a convenient companion for fern-hunters in the region which it covers. It also indicates a renewal of interest in the popular study of these plants which, in the past twenty years, has been of much service in bringing to light the fuller knowledge of their distribution and variation. Two species of *Isoetes* are described, and a series of field notes on these plants is included; these are timely, since this obscure group, more than any other, is in need (1) of careful and extended observation in the field, and (2) careful study under variation of water supply with special reference to its influence on the development of structures that have been used hitherto in classification, and (3) of comparative study in anatomical structures and their illustration. To none who have made greater or less contributions to the knowledge of this group in America has this possibility of the study of fresh material been possible, and there is much to be gained by those to whom the opportunity is open to study habits as well as comparative structures. If this booklet succeeds in stimulating this sort of observation it will have done a good work. L. M. U.

Proceedings of the Club.

WEDNESDAY EVENING, JANUARY 27, 1897.

In the absence of the President, Vice-President Rusby occupied the chair. There were twenty-one persons present.

Dr. H. Zahlbrückner, Natur-historische Hof-Museum, Vienna, Austria, was elected a corresponding member.

The scientific program of the evening was as follows :

By Dr. H. H. Rusby, "Remarks on some Solanaceae."

By Mr. A. A. Tyler, "The Nature and Origin of Stipules."

By Dr. J. K. Small, "*Aster gracilis* Nuttall."

By Mr. Geo. V. Nash, "New and Noteworthy American Grasses."

Dr. Rusby exhibited a number of Solanaceous plants and remarked upon their relationships. It was pointed out that the general appearance and chemical and physiological characteristics of these plants frequently fail to indicate their structural affinities. *Cestrum* and *Sessea*, *Atropa* and *Datura* were cited as illustrations of the separation of otherwise naturally related groups through their possession respectively of baccate and capsular fruits. *Nicotiana* was referred to as connecting those tribes having a radial symmetry, with the tribe Salpiglossidae, having a bilateral symmetry and thus connecting the family with the Labiales. The Androcera and Andropeda sections of the genus *Solanum* were instances of the appearance of this bilateral symmetry in a widely separated part of the family where radial symmetry is otherwise the rule.

Dr. Britton discussed the subject and remarked upon this instance of development of two divisions of a group along different lines, in this case through baccate and capsular fruits. He cited similar parallelisms in other families tending to produce different resulting characters, as in Capparidaceae; and remarked that an indication of the lines along which these genera have been derived may be indicated by these characters.

The second paper by Mr. A. A. Tyler on "The Nature and Origin of Stipules," presented conclusions derived from studies extending through several years. The subject was treated at length in the light of geological, morphological, anatomical and developmental evidence. Discussing Mr. Tyler's paper, which will shortly be published in full, Dr. Britton remarked that the outcome of this very important paper is most interesting; it emphasizes the significance of basal scales and those of buds and rootstocks; and it is the more convincing from the nicety with

which it accords with the seemingly haphazard distribution of stipules widely but irregularly here and there through the vegetable kingdom.

Of the remaining papers, that by Mr. Nash was read by title; it is printed in the January BULLETIN; that by Mr. Small was, on account of the lateness of the hour, deferred until the next meeting.

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